Interdisciplinary Approaches to Neuroscience I (NEUR 542)
Fall 2019

When and Where: Beckman Institute (room 3269), Mondays, Wednesdays, and Fridays from 5-5:50 PM.

Course Coordinator: Justin Rhodes, jrhodes@illinois.edu, 503-413-9241

Course Description: Interdisciplinary Approaches to Neuroscience I is the first of a two-part course series that is required for all first year graduate students in the Neuroscience Program (NSP). The purpose of the course is to introduce students to the breadth and inter-disciplinary nature of the field, and to the topic areas investigated broadly by faculty of the NSP. The course emphasizes concepts and methods rather than facts, and includes discussions and career development lectures. The course is team taught by multiple NSP faculty, senior students and postdocs. The first section begins with lectures on the evolution of the nervous system, and fundamental information about neural physiology, gene expression, behavior and transport processes in neurons. The second section consists of a several topics in cognitive, behavioral and clinical neuroscience.

Requirements: Attendance is mandatory. All first year NSP graduate students are required to take NEUR 542 and 543 their first year in sequence. Non-NSP students are expected to have a general background knowledge in one or more of the following areas related to the field of neuroscience: biology, chemistry, psychology, physics or engineering.

Website: An Illinois Compass 2g website at https://compass2g.illinois.edu/ has been established for the course. Lecture slides and reading materials will be posted there. You will also need to go to the site to complete weekly quizzes. You will need your Net ID and AD password to access the site.

Required Reading: Some units have required reading and others do not. Required readings will be posted on the Compass website in the instructor's folder. All required readings are listed below the schedule. Students are expected to read the material posted for the unit before or during the week the material is being presented (see below).

Grading: Your grade in this class will be determined based on weekly multiple choice or short answer quizzes (posted online) and two "perspective" papers. The assignments will be weighted as follows:

Quizzes (10)	10 points each x 10 = 100 pts
Perspective (2)	100 pts each = 200 pts

Quizzes: There will be 12 total quizzes based on the weekly lectures and readings but the lowest 2 quizzes will be dropped to account for absences or conflicts. The format for the quizzes will vary from week to week depending on the instructor, but typically include 3-5 multiple choice questions or short answers. The quizzes will be posted on the website on Monday following each week of lectures, and students are expected to work on the quizzes independently and post their answers by Friday, midnight of that week.

Perspectives: The first perspective will be due two weeks after the INTRODUCTION TO NEUROSCIENCE section of the course has completed on Friday by midnight. The second perspective will be due on the last day of the semester. The perspectives will take the following format. They will be a minimum of 5 pages in length and maximum of 10 pages not including references. At least 5 original references must be used. Students will take a topic from the section, formulate a critical question about the topic, and then research the answer to it. The perspectives will be graded based on originality of the question, quality of the research, appropriateness of the conclusions drawn, and quality of the writing.

Grading Scale	**A+**	**A**	**A-**	**B+**	**B**	**B-**
	98-100%	93 -97%	90-92%	88-89%	83-87%	80-82%
C+	**C**	**C-**	**D+**	**D**	**D-**	**F**
78-79%	73-77%	70-72%	68-69%	63-67%	60-62%	0-59%

Learning Outcomes
This course will cover diverse topics that change on a weekly basis, each week has one to several learning objectives. The following are three examples of learning outcomes from the first 4 weeks of the course: 1) By the end of the week, students will be able to critically evaluate claims made about specific human behaviors as being evolutionary adaptations, i.e., products of natural selection. 2) Students will learn what long term potentiation is, how it is a cellular model for learning and memory, how it is measured using principles of electrophysiology, and molecular mechanisms. 3) Students will learn current methods for measuring gene expression in brain tissue and individual neurons, and how genes interact with the environment to influence complex behaviors through transcriptional and epigenetic regulation.

Statement on Academic Integrity
According to the Student Code, `It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions.' Please know that it is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here: http://studentcode.illinois.edu/article1_part4_1-401.html

DRES accommodations: To insure that disability-related concerns are properly addressed, students who require assistance to participate in this class are asked to see the head instructor within the first two weeks of the start of the semester. Furthermore, you must make arrangements for special accommodations through DRES (Division of Disability Resources and Educational Services).

Date	Instructor	Material
		INTRODUCTION TO NEUROSCIENCE
Evolution of the Nervous System I		
Aug 26	Rhanor Gillette	Characters of the ancestral nervous system
Aug 28	Rhanor Gillette	Goal-directed behavior and the polarized nervous system
Aug 30	Rhanor Gillette	The evolution of complexity in brain and behavior
Special lectures		
Sept 2	No class	Labor day
Sept 4	Martha Gillette	Enabling Technologies
Sept 6	Justin Rhodes	The comparative method
Evolution of the Nervous System II		
Sept 9	Justin Rhodes	Side effects, spandrels and inter-gender hitchhiking
Sept 11	Class Cancelled	
Sept 13	Class Cancelled	
Neurophysiology I		
Sept 16	Catherine Christian	Basic principles: Ohm's Law, patch clamp, synaptic transmission
Sept 18	Catherine Christian	In vitro electrophysiology methods
Sept 20	Catherine Christian	In vivo electrophysiology methods
Neural and Behavioral Transcriptomics		
Sept 23	Gene Robinson	Brain gene expression and social behavior
Sept 25	Adam Hamilton	Dynamic genome concept
Sept 27	Ian Traniello	Toolkits for social behavior
Neurophysiology II		
Sept 30	Hee Jung Chung	Origins of electrical and resting membrane potentials
Oct 2	Hee Jung Chung	Ion channels and action potentials
Oct 4	Hee Jung Chung	Neurons as conductor of electricity

Transport Processes in Neurons

Oct 7	Kai Zhang	Signal communication within neuronal cells
Oct 9	Kai Zhang	Mobility and energetics of organelle transport
Oct 11	Vishnu Krishnamurthy	Axonal transport and neuronal growth

TOPICS IN COGNITIVE, BEHAVIORAL & CLINICAL NEUROSCIENCE

Neurobiology of Feeding Behaviors

Oct 14	Nu-Chu Liang	Taste and olfactory systems
Oct 16	Nu-Chu Liang	How taste and smell guide behavior
Oct 18	Nu-Chu Liang	Discussion

SFN week

Oct 21	No class SFN
Oct 23	No class SFN
Oct 25	No class SFN

Open

Oct 28	Justin Rhodes	How to give a good talk
Oct 30	Open Discussion	
Nov 1	Class Cancelled	

Object and Scene Recognition in the Human Brain

Nov 4	Diane Beck	Early vision and object vision
Nov 6	Diane Beck	Objects, faces, and places
Nov 8	Heeyoung Choo	TBD

Neuro-immune interaction

Nov 11	Makoto Inoue	Interaction in the PNS
Nov 13	Makoto Inoue	Interaction in the CNS
Nov 15	Makoto Inoue	Discussion

Intrinsic brain activity and the human connectome

Nov 18	Richard Bido-Medina	The rediscovery of intrinsic brain activity
Nov 20	Sepideh Sadaghiani	The human connectome
Nov 22	Sepideh Sadaghiani	The impact of intrinsic brain activity on cognition

Thanksgiving week

Nov 25	Thanksgiving break (no class)
Nov 27	Thanksgiving break (no class)
Nov 29	Thanksgiving break (no class)

Neuromechanics of posture and locomotion

Dec 2	Manuel Hernandez	Neuromechanics of posture and balance
Dec 4	Manuel Hernandez	Neurophysiology of gait
Dec 6	Manuel Hernandez	Brain activation changes during locomotion

Nutritional Neuroscience

Dec 9	Naiman Khan	Macronutrients
Dec 11	Naiman Khan	Micronutrients